Modeling Salesclerks' Utterances in Bespoke Scenes and Evaluating Them Using a Communication Robot

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Abstract. A paradigm shift is taking place, from the era of common off-the-shelf products to that of personalized products. In this study, we developed a communication robot that could improve customers' satisfaction in bespoke scenes, which is a sales method of personalized products. First, we extracted the model of the salesclerks' utterances that would be useful for improving satisfaction in bespoke tailoring. We modeled the salesclerks' utterances based on the utterance content. Next, we designed a bespoke origami task by communicating with a robot, which worked based on the salesclerks' utterance model. Then, we analyzed how the robot's utterances evoked customers' emotions and improved satisfaction. As a result, we revealed that the utterances that encouraged customers' decisions improved customer satisfaction.

Keywords: Bespoke · Communication robot · Expert salesclerk model

1 Introduction

A paradigm shift is taking place, from the era of common off-the-shelf products to that of personalized products [1]. Customers who have a certain level of knowledge can make customized products by themselves. On the other hand, customers who do not have a certain level of knowledge about products cannot make customized products by themselves and need support from salesclerks.

In our study, we focus on bespoke tailoring, which is a sales method for customized products. In bespoke scenes, customers communicate with salesclerks to tailor products. When salesclerks serve customers in actual stores, the salesclerks try to understand the customers' needs and what customers feel through communication, and they provide feedback such as appropriate suggestions and assistance accordingly, thereby improving customers' satisfaction. Sugimoto [2] conducted a study on the customer service of expert salesclerks who improve customers' satisfaction. In the study, Sugimoto investigated the behavior of salesclerks in suit bespoke. They found that expert salesclerks limited the number of choices and reassured the customers of their decisions. In this study,

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we modeled the salesclerks' utterances, which were useful for improving customers' satisfaction.

In addition, because of the spread of COVID-19, people need non-contact customer service to prevent infection. The number of opportunities robots to serve customers is increasing. There have been many studies about impressions of robots working in stores. Kubota [3] conducted an experiment in which androids spoke in an actual store. However, there were predetermined scenarios of utterances in Kubota's experiment, and androids could not communicate with customers flexibly. Thus, we oriented service robots that could communicate with customers based on an utterance model that could improve customers' satisfaction.

In this study, we first analyzed the utterances of salesclerks from videos of suit bespoke in an actual store, and we created an utterance model that improves customers satisfaction. Next, we designed an origami bespoke task in which a robot acts as a salesclerk and speaks according to our utterance model. Through the task we revealed that salesclerks' utterance model could improve customers' satisfaction.

2 Modeling Salesclerks' Utterances and Emotions in Bespoke Scenarios

2.1 Modeling Salesclerks' Utterances

In this study, we modeled the utterances of salesclerks from videos [4] of suit bespoke at the Family Bazaar (9/15–17/2018) held by a suit manufacturing and sales company. We referred to Sugimoto's study [2] and divided the videos into two types: ones with expert salesclerks serving the customers, and ones with novice salesclerks serving the customers. There were five videos in each category. The expert salesclerks' videos were totaled 90 min (mean 18 min, $SD = 11.85$ min), and the novice salesclerks' videos were totaled 105 min (mean 21 min, $SD = 9.85$ min).

Fig. 1. An example of actual bespoke tailoring consisting of three typical steps. A customer defines requirement and selects material and designs with a salesclerk.

In the analysis, we first divided the suit bespoke into three steps: In the first step, salesclerks listened to the customers' needs and usage of the suit (defining requirements). In the second step, customers selected the materials for the suit (selecting a material). In the third step, customers selected the designs, such as buttons and tucks (selecting design) (Fig. 1). Next, we tagged each salesclerk's utterances using the video analysis

tool ELAN (Fig. 2). To analyze salesclerks' utterances, we compared expert and novice salesclerks in terms of the amount of utterances, the kinds of utterances, and the transition of utterances. In the tagging process, the salesclerks' utterances were classified into six categories: "suggestion," "closed question (CQ)," "open question (OQ)," "explanation," "encouragement," and "other" (Table 1).

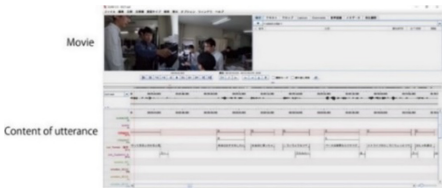

Fig. 2. Analyzing salesclerks' utterances using ELAN (annotation tool)

Table 1. Six categories of salesclerks' utterances

Category	Content	Example	Percentage
Suggestion	Suggest specific something	How about ~?	11%
CQ	Closed Question	Do you like bright one?	9%
OQ	Open Question	What color do you like? What do you want something?	3%
Explanation	Explanation about materials and designs	This material is ~. ~ is popular.	48%
Encouragement	Agree with customers' decisions	That' good I think that is good ,too.	5%
Other	Other sentences		24%

To compare the amount of utterances between expert and novice salesclerks, we conducted a t-test on the percentage of utterance time per minute for expert and novice salesclerks. It showed that the experts spoke longer than the novices did (Fig. 3 left). To compare the kinds of utterance between expert and novice salesclerks, we conducted a t-test on the number of utterances per minute for each of the five types of utterances. It showed that there was a significant difference between the expert and novice salesclerks in terms of the "suggestion" and "encouragement" utterances, indicating that the expert salesclerks used the "suggestion" and "encouragement" utterances more frequently than did the novice salesclerks (Fig. 3 right).

Next, to compare the transition of the five types of utterances, we made diagrams. The probability transitions of the five types of utterances of the expert and novice salesclerks in the material selection and design selection were calculated (Fig. 4). In the material selection, the experts offered repeated suggestions and explanations, and then multiple encouragement. On the other hand, the novices tended to repeat the explanations. In the design selection, the experts asked questions and made suggestions, and then they explained and gave encouragement. On the other hand, the novices tended to repeat questions and explanations, with little encouragement.

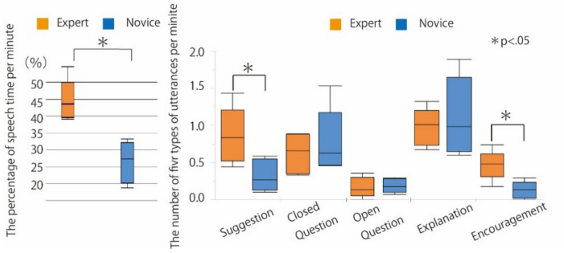

Fig. 3. The percentage of utterance time (left) and the number of the five types of utterances: suggestion, closed question, open question, explanation, and encouragement (right). The expert salesclerks spoke longer than did the novice salesclerks in bespoke. The experts' utterances contained more suggestions and encouragements than those of novices. (Bars indicate maximum and minimum. The line on the surface, bottom, and between them indicate upper quartile, lower quartile, and median, respectively.)

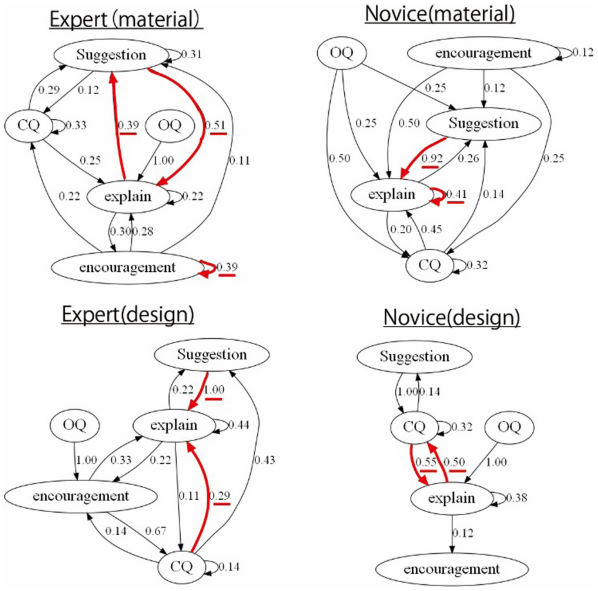

Fig. 4. The probability transitions of the five types of utterances of the expert and novice salesclerks in the material selection and design selection

2.2 Modeling Emotions in Bespoke Scenarios

To model emotions customers feel in bespoke scenarios, we extracted emotion words that were evoked in the suit bespoke from the study by Obata et al. [4]. We chose twenty-five emotion words. Forty-six students answered a questionnaire about the characteristics of these emotion words. The characteristics of the emotions here refer to where the emotions are located on Russell's core-affect model plane [5]. Each emotion word was evaluated in two dimensions: pleasure-displeasure and arousal-sleep. Each evaluation was made on a 5-point scale. The results of the questionnaire were transformed so that

the maximum value was +2 and the minimum value was 2, and the emotion words were distributed on Russell's core-affect model plane. After that, we determined representative and valid emotions of the eight domains on Russell's core-affect model through discussion. Thereby, we created the bespoke version of the core-affect model (Fig. 5).

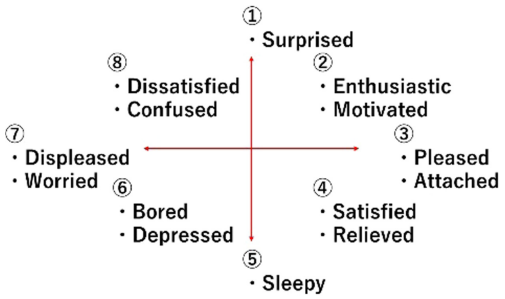

Fig. 5. A core-affect model of bespoke tailoring. We identified 13 emotions in eight categories.

3 Verifying the Effect of Robots' Utterances

3.1 Bespoke Origami

We analyzed salesclerks' utterances and made a bespoke utterance model. However, it is uncertain if robots can improve customer satisfaction. To evaluate if the robot's utterance could improve customer satisfaction, we designed the task of customizing an origami[1] box while participants communicated with a robot (origami task). The origami task consisted of three steps, as the suit bespoke did (Fig. 6): In the first step, participants reviewed six samples of origami boxes and selected one. In the second step, they selected sheets of origami. Eighty-three sheets of origami paper (5 cm squared) were regularly lined up on a rack, and participants selected the number of sheets they needed to make the box freely. In the third step, they selected designs for optional decorations on the box. Participants chose stickers and tape to decorate the box from a booklet with samples of stickers and tape. In this way, we created a situation in which the participants felt the same emotions as in suit bespoke.

3.2 A Robot Plays the Role of Supporter in Bespoke

In the origami task, a robot played the role of a salesclerk in the bespoke scenario. We used SHARP's RoBoHoN (Fig. 7). We developed an Android application that allowed the RoBoHoN to speak the sentences the experimenter entered on the remote PC. Using this application, we could communicate with the participants using the WOZ (Wizard of Oz) method [6]. The experimenter watched the participants on a monitor and operated RoBoHoN. Based on the expert salesclerks' utterances model, RoBoHoN spoke encouraging utterances when participants made choices and spoke suggestion utterances when they were troubled.

[1] Origami: Japanese traditional paper craft.

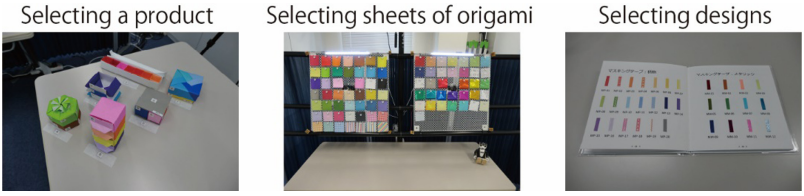

Fig. 6. Product samples of our bespoke origami box. We designed the task to fit with suit bespoke. First, participants selected an origami box. Next, they selected sheets of origami paper. Finally, they selected options from a booklet. Each step corresponds to defining requirements, selecting material, and selecting designs, respectively, in suit bespoke (Fig. 1).

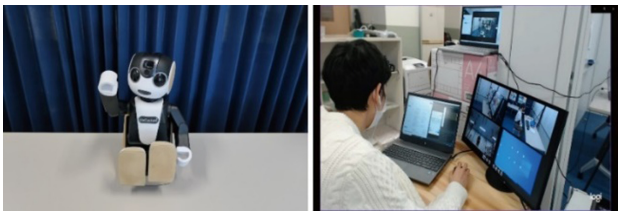

Fig. 7. The experimenter operated the service robot (RoBoHoN) through monitors.

3.3 Experiment Processes

Participants conducted an origami bespoke tasked with the help of RoBoHoN. Participants first chose one of the six products and selected sheets of origami paper from the rack. After that, they decided on the design by looking at the booklet (Fig. 8). After they had completed the task, we conducted an interview survey. The participants watched videos of their own bespoke activity and reported the changes in their emotions and satisfaction levels during the task. The participants reported the time when their emotions or satisfaction levels changed during the task and selected one from the emotion groups as the most appropriate emotion they felt at that time. At the same time, participants selected one of the following three options: "satisfied," "dissatisfied," and "neither." If participants answered "satisfied" or "dissatisfied," they recorded the degree to which they felt it on a 5-point scale ("1: not at all" to "5: very much so"). The degree of satisfaction (satisfaction level) was evaluated on an 11-point scale (from –5 to +5), with "satisfied" on a scale of +1 to +5, "dissatisfied" on a scale of –1 to –5, and "neither" as 0. Participants were 26 students (12 males and 14 females).

3.4 Result of the Experiment and Discussion

The total duration of the experiment was 551 min (average: 21 min per participant), and the total number of RoBoHoN utterances was 724 (average: 27.9 utterances per participant, 1.3 utterances per minute). Of these, the suggestion utterances were spoken a total of 66 times to 23 participants, and the encouraging utterances were spoken a total of 148 times to all participants.

Fig. 8. An example of the origami box bespoke task. The red circles show the robot, which serves customers just like a bespoke tailor.

We compared the percentage of evoked emotions in the 20 s before and after the suggested utterances (before: –20 to 0 s, after: 0 to 20 s) for 23 participants. Participants felt more "enthusiastic" after the utterances than before the utterances (t (22) = 2.25, $p = .035$, $d = .23$) and felt less "satisfied" after the utterances than before the utterances (t (22) = 2.56, $p = .018$, $d = .36$). Similarly, when comparing the mean values of satisfaction for 20 s before and after the utterances, there was no change in satisfaction level before and after the utterances (Fig. 9).

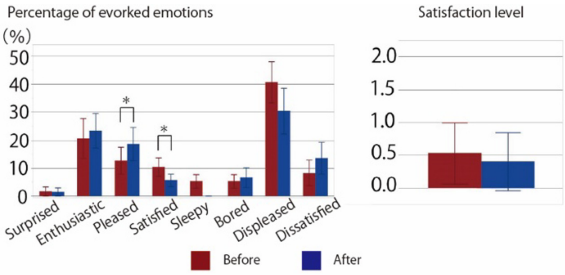

Fig. 9. Participants felt less "pleased" after "suggestion" utterances than before the utterances significantly. Participants felt more "satisfied" after the utterances and after the utterances, but satisfaction level didn't change.

Next, we compared the percentage of evoked emotions in the 20 s before and after the encouraged utterances for 26 participants. Participants felt more "satisfied" after utterances than before utterances (t (25) = 2. 96, $p = .004$, $d = .43$) and felt less "displeased" after utterances than before utterances (t (25) = 2.39, $p = .018$, $d = .30$). Similarly, comparing the mean values of the satisfaction levels for 20 s before and after the utterances, the satisfaction level after the utterances was higher than before the utterances (t (25) = 3.39, $p = .002$, $d = .33$) (Fig. 10).

The satisfaction levels after the encouraging utterances were higher than before the utterances. However, the participants' satisfaction levels might have increased simply because of participants making choices (e.g., deciding which suit materials to choose). This is because the RoBoHoN spoke encouraging utterances when the participants were selecting their origami and designs. Here, to prove that the encouraging utterances were the factor that increased the satisfaction level, we compared the satisfaction levels in the 20 s before and after the "choice" scene, in which there was no utterance by RoBoHoN. Such "choice" situations were found in 16 of the 26 participants. There was no change

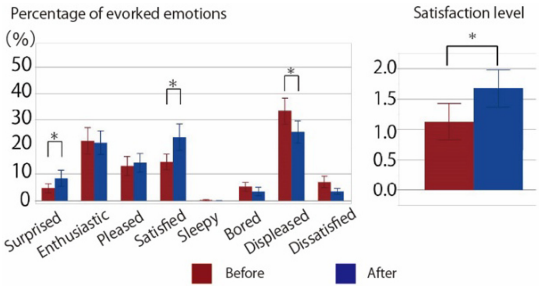

Fig. 10. Participants felt significantly more "satisfied" after encouraging utterances than before them. Participants felt less "displeased" after the utterances, and satisfaction level also increased significantly.

in satisfaction levels 20 s before and after the "choice" scene (t (15) = 0.32, p = .751). Therefore, we proved that the participants' satisfaction levels did not increase due to the "choice" but due to RoBoHoN's encouraging utterances.

4 Conclusion

In this study, we first modeled the utterance of salesclerks in suit bespoke and revealed that the robot's utterance based on the model could improve customers' satisfaction. The origami task included typical bespoke elements: There were communication and steps. Therefore, we believe that the robots can improve customer satisfaction in other types of bespoke scenarios. The present study will be useful to serve also in the VR space.

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